# *Artificial Yeast Polarization Controlled by Chemical Gradient*

James K. Nolan, Purdue University and Bernard Tao, Purdue University

Engineering synthetic multicellular systems will lead to new synthetic biology technological platforms, inform developmental biology through recapitulation of natural systems and possibly unveil novel morphologies with practical applications not before reached throughout natural history (Maharbiz, 2012). Creating an exogenous molecular circuit that will polarize unicellular cells into “apical” and “basal” domains relative to a substrate plane would fulfill a missing component towards fully multicellular synthetic cellular communities (Maharbiz, 2012). To this end, a $PIP_3$ polarization network previously designed by Chau and associates (Chau, Walter, Gerardin, Tang, Lim 2012) was coupled to the specific activation by niacin of a recombinant G protein coupled receptor (GPCR) within *Saccharomyces cerevisiae*. The niacin-specific GPCR is intended to localize Cdc42*, the opposite node of the two-node $PIP_3$ polarization network, and orient polarization parallel to a niacin gradient originating from a perpendicular medium surface. Further effort will be needed to create and experimentally analyze this proposed network. If successful, this work will aid future construction of a simple “epithelium” of normally unicellular organisms for accomplishing coordinated and even compartmentalized bioprocess and filtration tasks.